18 Feb 82	Construction began on the Backup Facility (to the NORAD Cheyenne Mountain Complex) at Peterson AFB.
Mar 82	TAC rejected the addition of the Time Division Data Link (TDDL) to the F-15 because of its apparent conflict with the Joint Tactical Information System (JTIDS).
6 Mar 82	Flight 10 (Satellite 13) Defense Support Program satellite launched from the Air Force Eastern Space and Missile Center.
2 Apr 82	National Project Industry Team reached a decision to cancel ITT-North contract for NTX-2000 communications switch for the ROCCs.
5 Apr 82	(U) The 48th FIS at Langley AFB completed its conversion to F-15s.
22 Apr 82	Flight 10 turned over to ADCOM by Space Division (AFSC) as an operational sensor.
21 May 82	SAC accepted GEODSS Site 1, Socorro, New Mexico, from ESD.
21 Jun 82	The Air Force announced it was forming a new major command, Space Command, in Colorado Springs.
22 Jun 82	HQ USAF issued its Program Management Directive on the Consolidated Space Operations Center (CSOC).
22 Aug 82	CINCNORAD officially opened the new Core Processing System computer facility in Cheyenne Mountain.
1 Sep 82	Space Command activated under the command of General James V. Hartinger. Lieutenant General Richard C. Henry became vice commander.
2 Sep 82	The Simplified Processing Station for DSP attained full operational capability.

Chapter I

MISSION, ORGANIZATION, AND RESOURCES

Mission and Organization

NORAD, ADCOM, and ADC

On 12 September 1982 the North American Aerospace Defense Command celebrated 25 years of United States-Canadian cooperation in air defense of North America. The first terms of reference for the binational command, approved by the military chiefs of the two countries in June 1958, gave NORAD the mission of defending the continental United States, Canada, and Alaska against air attack and supporting other continental U.S. and Canadian commands. Air defense remained the cornerstone of the alliance, although increasing emphasis went to the command's role in missile warning and assessment and space surveillance. Most evident in this regard was the redesignation of the command as North American Aerospace (vice Air) Defense Command on 12 May 1981. The primary objectives of NORAD, as stated in the Agreement signed by the U.S. Secretary of State and the Minister of External Affairs of Canada on 11 March 1981, were:[1]

a. To assist each nation to safeguard the sovereignty of its airspace;

b. To contribute to the deterrence of attack on North America by providing capabilities for aerospace surveillance warning and characterization of aerospace attack, and defence again against air attack; and

c. Should deterrence fail, to ensure an appropriate response against attack by providing for the effective use of the forces of the two countries available for air defence.

Those responsibilities continued in force throughout 1982. The Agreement will come up for renewal in 1986.

The U.S. component of NORAD was Aerospace Defense Command (ADCOM), a Joint Chiefs of Staff specified command. U.S. forces assigned to ADCOM were normally under

the operational control of CINCNORAD.[1]

b1

The Aerospace Defense Center, a Direct Reporting Unit (DRU) to the Chief of Staff, USAF, provided staff support for USAF functions and responsibilities pertaining to NORAD/ADCOM's aerospace defense mission.* CINCAD mission responsibilities were set down in the Joint Chiefs of Staff Unified Command Plan (UCP), last published in 1975. In early 1980, the JCS stated its intention to review the UCP every two years, and asked all unified and specified commands for their recommended changes to the document. CINCAD responded with minor revisions to clarify NORAD and ADCOM mission responsibilities. The review was delayed, however, as the JCS turned its attention first to development of a Rapid Deployment Joint Task Force (RDJTF) for the Middle East, and then to creation of a unified command for contingencies in that area. In April 1982, the JCS was ready to consider changes to the UCP. ADCOM essentially repeated what it had submitted in early 1980.[2]

b1

These were CINCAD's responsibilities, and he would have an opportunity to present his views in a meeting of command representatives in late January 1983.[4]

Formation of Space Command

The activation of Space Command, the first new major command formed by the Air Force in 32 years,** was the most significant organizational event of the year, one which promised to have a profound influence on future U.S. military activities in space. The background of this decision and the event are discussed below. Most of the organizational actions which will bring the command to full strength, however, would take place during 1983, and will be

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* For its reassignment following activation of Space Command see p 11.

** Several other commands, e.g., Air Force Communications Command and Electronic Security Command, were redesignated MAJCOMs from a service status.

discussed in the next installment of the History of Space Command.

Space Division of Air Force Systems Command had been "minding the [space] store for two decades."[5] In the process its responsibilities grew beyond traditional research and development functions, and came to encompass the operation of space systems as well. This was a logical consequence of the technical sophistication of spacecraft, their high cost per unit, and the unknowns of space operations. In the 1960s the Air Force began to train military personnel in the operation and maintenance of sophisticated ground based and, later, space surveillance systems. From 1967 to November 1979 ADCOM maintained a military space launch organization, the 10th Aerospace Defense Squadron, at Vandenberg AFB, California.[6] The research and development community, however, heavily supported by civilian contractors, remained dominant in the operation, management and oversight of space systems, because the line between experimental and operational systems often could not be defined. The early 1970s marked the transition of space programs from experimental to operational status. To meet the growing Soviet space threat, the Air Force assigned satellites on a functional basis to commands which seemed to have the greatest need. Space Division remained the only organization which followed a space system through its entire life cycle from design to deorbit.[7] The dispersal of space activities across several commands was not a problem when only a few systems with limited capabilities were involved, but when systems possessing multiple capabilities came along, it became more difficult to delineate clearly their functional assignment.[8]

A case in point was the Space Shuttle. It was an Air Force-NASA cooperative venture to develop a vehicle with the ability to fly in both the atmosphere and in space. The Air Force regarded the Shuttle as an opportunity to regain the space flight momentum it had lost when the Manned Orbital Laboratory program was scrapped in 1969. Several commands believed that either by virtue of their past association with space programs, or because they would be prime users of the vehicle, or both, they should be named its operator. In 1974, SAC, ADCOM, and MAC each argued it was the best choice to operate the system. AFSC nominated itself for that role. The Air Staff studied the feasibility of naming the ultimate operator at this early point in the development process and then deferred the decision. ADCOM concluded this was because of a combination of reluctance to

disturb the existing DOD/NASA relationship by displaying a greater degree of DOD participation which the operational decision would require, and the continuing strong belief within the research and development community that the STS should be considered a research prototype and not an operational system.[9] Further attempts by prospective Shuttle operators during the next two years failed to move the Air Force to a decision. By the middle of 1977, uncertainty about future major command structures, along with an Air Staff study on the feasibility of disestablishing ADCOM, had the effect of shelving the issue.[10]

The ADCOM reorganization study, which appeared in first draft in September 1977, proposed to transfer the command's atmospheric defense resources to TAC and its missile warning and space surveillance resources to SAC. The MAJCOM would then be inactivated and a small management headquarters left behind to support CINCNORAD/CINCAD's binational and specified command responsibilities. While ADCOM had serious reservations about the proposal, the most difficult part was loss of its space expertise to SAC. The final draft study ("Proposal For: A Reorganization of USAF Air Defense and Surveillance/Warning Resources or "the Green Book") stated that one of the major considerations that had favored the reorganization was the advantages to be gained from centralizing space responsibilities in a single operational command, and the logical choice was SAC.[11]

[redacted]) The emergence of SAC as the prime contender for the space operations mission was but one of several signs that the Air Force was about to take a bolder course in space. [redacted]

b-1

[redacted] top Air Force management gave increased attention to the problems of transition from what had heretofore been largely a passive role in space to a more active operational one. Speaking at an Air Force Academy space seminar in August 1978, Major General Hoyt S. Vandenberg, Jr., Air Force Deputy Chief of Staff, Operations, Plans and Readiness, said he hoped the R&D image of space systems which had prevailed long after they had reached operational maturity could be changed by assigning them to operational commands as early as possible in the development process. The Air Force needed, he observed, an organizational framework for space, "perhaps a space command."[12]

At the forefront of those who believed the Air Force needed to think more about space policy and organization was Under Secretary of the Air Force, Dr. Hans Mark. At first apprehensive that the ADCOM reorganization might prejudice a future space decision, since SAC would inherit ADCOM's space assets; by September 1978, Mark had become convinced that "... none of the /reorganization/ steps are irreversible ...," and that at a later date the residual ADCOM organization could become the nucleus of a space command. He felt the Air Force should go ahead with the reorganization in order to clear the way for what was in his opinion the more important issue of organizing for space.[13] Secretary of the Air Force John Stetson agreed, and while he approved the reorganization plan and sent it on to Secretary of Defense Harold Brown for decision, he also requested the Air Force select a group of general officers to consider future space organization.[14] The Air Force would not, however, at this late date entertain any proposal about future space organization which would in any way change the direction of the ADCOM reorganization. General James E. Hill, as CINCAD, wrote General Allen in February 1979 recommending the reorganization continue with air defense resources being reassigned to TAC, but that space and missile warning resources not be turned over to SAC but used as the nucleus of a new command to which other space assets would eventually be assigned. The suggestion, Hill recalled later, was not well received, and the organization proceeded as planned.[15]

The study requested by Secretary Stetson, the Space Mission Organization Planning Study (SMOPS), was completed in early 1979. It considered various management alternatives for organizing Air Force space missions and responsibilities, and essentially offered a choice between a functional arrangement, one which would continue the present system of assigning responsibility for space systems on a case-by-case basis, and a centralized one, which would assign all assets to an existing command or place them under a new Space Command or a Space Service (an evolutionary organization under AFSC). The SMOPS executive committee did not, however, recommend any single position or schedule for carrying out any organizational alternatives, but it concluded the Air Force should pursue several organizational objectives. Reactions to the study from field commanders showed, not unexpectedly, a diversity of opinion about what should be done and when it should be done, but most of them agreed that whether space went to an existing organization or to a newly formed one, stronger centralized management was needed.[16]

General Allen made no major organizational changes as a result of SMOPS, but beginning in the summer of 1979 the Air Force took several interim steps to clarify the distinction between development and operations. On 1 June it created the Manned Space Flight Support Group (Detachment 2 of SAMSO) at NASA's Johnson Space Center to train officers as Shuttle mission controllers. On 1 October 1979 the AFSC Space and Missile Systems Organization (SAMSO) was divided into two new organizations--Space Division and the Ballistic Missile Office--an action which reestablished the separate missile and space organizations out of which SAMSO had been created in 1967. In September 1980, the Air Force created within Space Division a Deputy Commander for Space Operations to provide a single point of contact for space operations. The internal HQ USAF organization was also realigned in September 1981 to gain a sharper focus for space planning and operations. The Air Force formed a Directorate of Space Operations (XOS) in the DCS for Plans and Operations.[17]

Organizational push also came from the direction of Congress. On 8 December 1981, Representative Ken Kramer (R-CO) introduced a bill to change the name of the Air Force to the United States Aerospace Force and to direct the Secretary of the Air Force to submit to the Congress a report on the desirability of creating a Space Command.[18] Although the Air Force did not favor a name change, it was, as expressed by Secretary Verne Orr and General Allen in early 1982, moving toward a Space Command.[19] But while there were strong strong indications that the Air Force saw a Space Command in its future, there remained a divergence of opinion, as expressed at two gatherings of space specialists in early 1981,* as to whether one should be created immediately or be allowed to emerge as a logical consequence of further organizational evolution.

An evolutionary approach was offered by General Robert T. Marsh, commander of AFSC, at a meeting of senior Air Force leaders in late February 1982. This proposal did not include the formation of a space command. It did address realignment of responsibilities of Space Division (SD) by dual-hatting the SD commander as ADCOM's Deputy

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* The Air University Airpower Symposium on the Role of the Air Force in Space, in February 1981, and the Air Force Academy Space Doctrine Symposium, in April 1981.

Commander for Space. The AFSC presentation also featured the establishment of direct links between Space Division and the Undersecretary of the Air Force and proposed creating a Special Assistant for Space on the Air Staff. General Allen asked Generals Ma_sh and Hartinger to work out the details of a proposal and to report back to him.

Subsequently, a Working Group of ADC, AFSC, SD, and Secretary of the Air Force (Special Projects) officers was formed and began to consider a number of space organizational alternatives. ADC officers of the Working Group were convinced that ultimately an Air Force major command was needed because of the fragmented management of space among 26 major organizations, the lack of an operational advocate for space systems, and the lack of provision for the use of space systems in wartime. Additional work was necessary to resolve differences between the ADC and AFSC positions on space organization. A particularly difficult issue was how the Consolidated Space Operations Center (CSOC) would fit into the future organizational structure. On 17 April, General Allen and a group of senior Air Staff officers received the AFSC/ADC briefing, a refined and more complete proposal than the one presented in February. An option offered by General Hartinger for establishment of a Space Command (MAJCOM) organization (see Chart I-1 following) was supported. General Allen agreed the organizational direction should be toward a Space Command.

The proposal then went to the Space Operations Steering Committee of the Air Staff for further refinement and the working out of details. The proposal which General Allen approved in early June gave the proposed Space Command resource management responsility for two operational space systems (the Satellite Early Warning System and the Defense Meteorological Satellite Program), ground missile warning and space surveillance sensors, the Cheyenne Mountain Complex, and several bases. Space Division would continue to be responsible for launch support and on-orbit support of space systems. The Space Division commander would be dual-hatted as Vice Commander of Space Command (see Air Staff Chart I-2 following).[20]

On 21 June 1982, in a Pentagon press conference held by General Lew Allen, Jr., and Undersecretary of the Air Force E. C. Aldridge, the Air Force announced its decision to form a new major command on 1 September. The official news release stated: "Creation of Space Command will further consolidate USAF operational space activities,

ESTABLISH SPACE MAJCOM

RESOURCE MANAGEMENT

Chart I-1

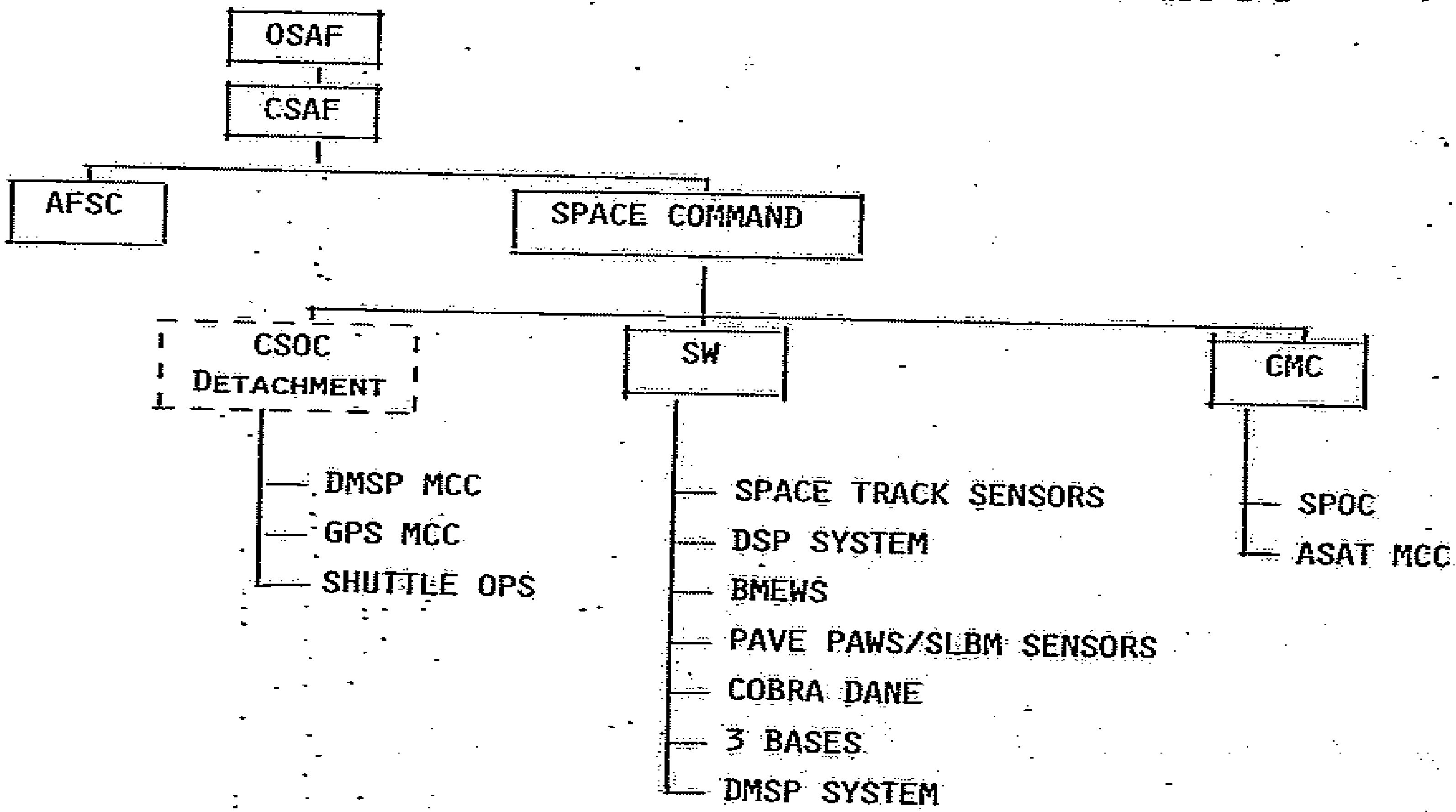
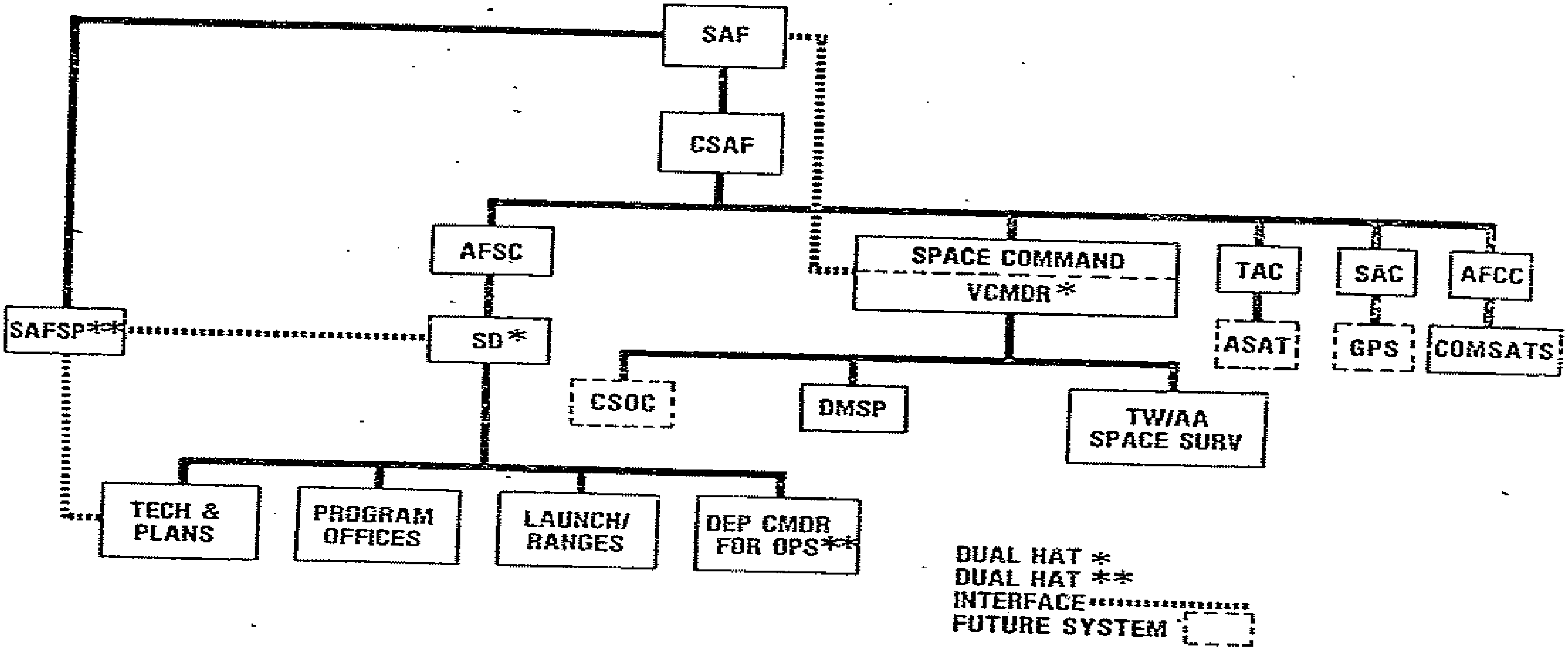


CHART I-2



SPACE ORGANIZATION - RESOURCE MANAGEMENT

Source: HQ Space Command
Activation Plan (CAP), 1 Nov 82

provide a link between the space-related research and development process and operational users, and retain North American Aerospace Defense Command authority and responsibilities as currently organized. It is the Air Force's hope and belief that Space Command will develop quickly into a unified command."[21] Undersecretary Aldridge called the decision "... a prudent evolutionary step in the management and operation of Air Force space systems," and said he viewed the new command "... as an embryonic structure which will develop and expand its role and responsibilities as it matures and as space missions evolve."[22] The Air Force chose General James V. Hartinger to head the new command. He also retained his responsibilities both as Commander in Chief of the specified command ADCOM and as Commander in Chief of the binational command NORAD. Lieutenant General Richard C. Henry, Commander of Space Division, AFSC, was named Vice Commander, Space Command.[23] The new command's mission in short would be to manage, control, and protect operational space assets.[24] As expressed by its first commander, Space Command would provide "... a focus for centralized planning, consolidated requirements and an operational advocate and honest broker for USAF space systems. We will provide the operational pull to go along with the technology push which has been the dominate factor in the space world since its inception."[25]

(U) On 1 September, Space Command was officially activated in a ceremony on the parade ground at Peterson AFB. General Hartinger took command, and also received from Undersecretary of the Air Force Aldridge the Defense Distinguished Service Medal. He told a crowd of about 1,000 that creation of the new command was a "crucial milestone in the evolution of military space operations." In his remarks, Undersecretary Aldridge said the ocassion marked the nation's "firm commitment to a space program to strengthen national security and to maintain U.S. space leadership." Space Command was, he added, "... a major step towards the preservation of peace."[26]

(U) In a corollary organizational move, on 1 October the Air Force established a Space Technology Center at Kirtland AFB, NM, by transferring some technology development elements from Space Division to Kirtland and assigning to the center three laboratories: the Air Force Geophysics Lab, Hanscom AFB, MA; the Air Force Rocket Propulsion Lab, Edwards AFB, CA; and the Air Force Weapons Lab, at Kirtland.

Beginning with a nucleus of space personnel already assigned to the Aerospace Defense Center,* and augmented by approximately 200 spaces to be transferred from SAC headquarters, Space Command was expected to grow to approximately 8,000 officers, airmen, and civilians assigned by the end of fiscal year 1983, when all the organizational actions to form the command would be completed. Missile warning and space surveillance units would be reassigned to Space Command between April and September 1983. Day-to-day management of these units would be the responsibility of 1st Space Wing, a new organization to be established at Peterson AFB in January 1983. In addition to Peterson, the new command would also gain ownership of Thule, Sondrestrom, and Clear ABs from SAC.[27] Using the Air Force Program Action Directive (PAD 82-1), 25 August 1982, and the Space Command Activation Plan, 1 November 1982 as guides for its actions, Space Command planners prepared a programming plan (82-1),* which set down the responsibilities of staff agencies in developing transition plans for transfer of over 50 space and missile warning systems, bases, units, and upgrade projects from SAC during the next 13 months. The time-phased actions in these plans were driven by the availability of manpower and system expertise within the staff. Special care would be taken that no responsibility was assumed prematurely. On 15 November, the first three acquisition projects were transferred (two programs to upgrade DSP satellites and one to improve the DSP overseas ground station). On 1 December SAC turned over two BMEWS projects to Space Command. At the end of the year transitional planning was on schedule.[28]

Resources

Manpower

The following table illustrates Space Command's manpower situation on 31 December 1982.

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* ADC was reassigned to Space Command and provided the USAF management headquarters staff responsible for development of operational doctrine for strategic air defense.

TABLE I-1

Authorized

Organization	Officers	Enlisted	Civilians	Total
HQ Space Command	283	127	189	599
Space Combat Operations Staff	299	303	116	718
HQ Aerospace Defense Command	44	12	14	70
Air Defense Operations Center	1	26	0	27
System Integration Office	34	4	13	51
Cheyenne Mountain Support Group	6	38	17	61
1010 Special Security Squadron	1	87	0	88
1010 Civil Engineering Squadron	4	62	52	218
Field Units	75	54	2	131
Total	747	813	403	1963

Assigned

Total	697	796	396	1889

The total number of 1963 perso el authorized for Space Command at the end of 1982 represented a rise of 198 over the 1765 personnel authorized for the Aerospace Defense Center (ADC) at the end of 1981. The figure of 1889 total assigned personnel for Space Command at the end of 1982 topped the figure of 1791 assigned personnel for ADC at the end of 1981 by 98.[29]

In augmenting its staff to carry out its new MAJCOM responsibilities, Space Command set up a three-step reporting program. Phase I, which set 31 October 1982 for reporting, covered personnel who would form a necessary initial cadre to carry out new support and functional tasks. Phase II, which set 31 December 1982 for reporting, covered personnel needed to support the transfer of Peterson AFB from SAC to Space Command. Phase III, which set 31 March 1983, covered personnel needed to support the remaining SAC space functions transfering to Space Command.[30]

The number of personnel authorized under NORAD's Joint Table of Distribution (JTD) on 31 December 1982 was 571, 12 more than it had been on 31 December 1981.* The total number of personnel assigned under the JTD at the end of 1982 was 557. This represented an increase of 14 over the previous year.[31]

Budget Matters

Space Command and SAC agreed SAC would retain primary comptroller responsibility during FY 1983 for those units transfering to Space Command during the fiscal year. As the units transitioned to Space Command, it would assume resource management responsibility. Space Command's comptroller personnel would also participate in submitting the FY 1984 Financial Plan and the FY 1985 Operating Budget.[32] The table on the following page lists ADC's Operations Budget for FY 1981 and 1982 and Space Command's Colorado Springs and SAC Operations Budget for FY 1983.

Supplementing the normal budgeting process, the CINC Command and Control Initiative Program continued to finance timely and low-cost improvements to command and control systems. $148,000 in FY 1982 funds for upgrade of the intra-base radio net were transferred to four projects.** $22,000 went to complete the acquisition of additional memories with eight thousand bit capacities for Communications System Segment communications multiplexers.

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* For detailed table of 31 December 1982 JTD, see Appendix VI. For 31 December 1981 JTD table, see Appendix 9, History of ADCOM/ADC, 1981.

** This amount of money was funded but in excess of what was needed for the upgrade.

TABLE I-2

ADC Operations Budget for FY 1981 and 1982 and Space Command Operations Budget for FY 1983

(in millions) [33]

	Major Force Program	ADC FY 1981 (actual)	ADC FY 1982 (actual)	Space Command Colorado Springs FY 1983 (funded)	Space Command HQ SAC FY 1983 (funded)
I.	Strategic Forces	$42.034	$44.273	$59.737	$270.635
II.	General Purpose Force	0.910	0.317	0.060	———
III.	Intelligence and Communications	1.019	1.148	1.975	4.419
IV.	Airlift/Sealift	———	———	———	0.139
VIII. A	Training and Other General Personnel Activities	0.006	0.018	0.036	0.514
VIII. B	Medical Programs	———	———	———	3.405
IX.	Administration and Associated Activities	0.036	0.074	0.077	———
		$44.005	$45.830	$61.885	$279.112

$16,000 was used to purchase a TEMPEST word processor for the Backup Facility, saving $49,000 it would cost to lease the equipment over eight years. $35,000 bought a card terminal needed to enable the $1,100,000 communications support processor to handle NCMC card traffic. Finally, $75,000 provided money for important modifications to Core Processing System upgrade in Cheyenne Mountain.[34]

The JCS approved two CINCAD C^3 initiatives for FY 1983. It okayed $300,000 for expanding an audio-visual switch matrix in the NCMC. This project had been postponed from FY 1982. The JCS also supported $235,000 for an NCMC briefing station upgrade. The old briefing station used technology current in 1968 to display maps and charts. State-of-the-art components installed in the upgrade would furnish greater video clarity and magnetic storage of data to permit easy editing and recall.[35]

Aside from the Operations Budget and the CINC initiative funding, overall USAF funding of systems affected important NORAD and Space Command systems. Existing funding deficiencies could bring about the curbing or elimination of a number of major systems. In particular, inadequate funding of the Ballistic Missile Early Warning System (BMEWS) Radar Upgrade could result in either no upgrade or inadequate upgrade of the BMEWS radars. A funding shortfall raised the possibility there would be no replacement of the Communications System Segment. Congress eliminated the $39 million in FY 1983 funding for Northern Warning which prevented the program from starting in FY 1983. A shortage of funding for the Ground Wave Emergency Network would delay the completion of the program. Though adequately funded for FY 1983 and FY 1984, a shortfall of $229.6 million in FY 1985 threatened to delay the completion of the Consolidated Space Operations Center. The Military Strategic and Tactical Relay System, as planned, would experience a $681.3 million shortfall in FY 1984 through FY 1988, with the prospective result the government would procure fewer terminals and consequently there would be fewer users. And the Space Defense System, consisting of the Antisatellite Program and Space Based Surveillance Systems, would suffer a relatively minor deficit in funding of $73 million in the fiscal years 1985 through 1988, the effect of which was uncertain.[36]

Space Command Expansion in Chidlaw Building

Many of the new personnel needed to staff the Space Command headquarters would work in the Chidlaw Building.

The expansion of the Off-Site Test Facility in the Federal Building and the modernization in the Cheyenne Mountain Complex would crowd those facilities, and necessitate the movement of personnel from those locations to the Chidlaw Building. In addition, the Operations Training Division of the Directorate of Training and Exercise moved from the Mountain to the Chidlaw to acquire more classroom space. The population of the Chidlaw would thereby be increased by about 600 people.[37]

This would eliminate the surplus of space resulting from the realignment of ADCOM in 1979. On 11 August 1981, NORAD had written the U.S. Army Corps of Engineers requesting 24,900 square feet of Chidlaw space be turned back by the Air Force to the General Services Administration. But by May 1982, because of new developments the Air Force clearly needed the entire building. Consequently, on 29 September 1982, the Military Construction Committee of the House Armed Services Committee approved Air Force's request to continue using all 218,130 square feet in the Chidlaw Building.[38]

The GSA's lease of the building would expire on 16 February 1983. It had cost the GSA $300,000 rent per year over the past five years. To cover this rent and security, maintenance, and utility charges, in FY 1982 the Air Force paid GSA $1,402,160 for the Standard Level User Charge (SLUC) and an additional $231,000 for services and rehabilitation. But the GSA's rent was due to rise. At the end of December 1982, the leaseholder signed a lease good through 30 September 1986, raising the annual rent to $1.052 million. It was expected the GSA would cosign the new lease before the expiration of the old one on 16 February 1983, thus insuring Air Force occupancy of the Chidlaw Building until the end of FY 1986. After signing the new lease, the GSA would hire an independent appraiser to ascertain the average per foot cost of leased business space in Colorado Springs. The GSA would use this figure to determine the Air Force's new SLUC.[39]

Since Space Command and NORAD would continue occupancy of the Chidlaw Building for at least several more years, building maintenance assumed greater importance. Since 1980, the GSA maintenance staff working at the GSA managed Chidlaw and Federal buildings had been reduced from 13 to six. In the meantime the workload increased. In the Federal Building, the Space Defense Operations Center Off-Site Test Facility required much work by the GSA staff.

In addition, two new computers in the Chidlaw Building placed more of a burden on GSA's personnel. The combination of too few GSA personnel and their increasing workload resulted in the deferral of some Chidlaw projects. At the same time, for the same reasons, preventive maintenance to the two buildings and their equipment fell behind schedule. The Chief of Staff believed it was essential for the GSA to hire additional maintenance personnel to keep up with both buildings, maintain the critical operations in the Federal Building, and avoid deferral of projects in the Chidlaw Building. By the end of the year, GSA had promised only one additional maintenance person to help alleviate the problem.[40]

Besides normal maintenance, several longstanding problems affected the Chidlaw Building. 1500 square yards of carpeting required replacement by the GSA at an estimated cost of about $20,000. There was substantial ground water leakage into the executive offices on the first floor. The owners attempted to correct this by resealing the building expansion joint and providing additional drainage away from it. But the roof also leaked and the surface of the parking lot had deteriorated seriously. Under terms of the lease being processed at the end of 1982, the owners would take care of the necessary repairs to the roof and parking lot in 1983.[41]

The schedule for reorganization of offices and reoccupation of vacated space under Space Command called for the completion of all moves and associated construction by 1 June 1983. For the initial construction work, begun on 22 November 1982, Space Command used a PRIME BEEF team.* It continued its work into 1983. In the first half of 1983, a commercial company would complete construction connected with the move.[42]

To make additional room available within the Chidlaw for the new and expanded offices, the 427M Program Software Development contractor, Ford Aerospace Communications Corporation, and subcontractor, Systems Development Corporation (SDC), had to move from the build-

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* PRIME BEEF was a mobile civil engineering team capable of immediate response to repair, replace, or modify base facilities. The PRIME BEEF team sent to Space Command was on a training mission.

ing. During FY 1982, the Air Force provided office space, equipment, furniture, and telephone service in the Chidlaw Building to 69 personnel working for these two companies. Ford employed 14 and SDC 55. Ford moved all its people to the nearby Wayne Building by 15 November 1982. By 1 December 1982, SDC reduced its staff in the Chidlaw to 38. Tentatively, it was thought SDC could remain in the Chidlaw until 1 April 1983. But as it developed, Space Command needed SDC-occupied space by 1 January 1983 to build a Sensitive Compartmented Information vault. The cost of moving SDC out by 1 January 1983 was $100,000.[43]

Toward a New HQ Space Command Building

The announcement, on 21 June 1982, of the formation of Space Command in Colorado Springs changed the requirement for the type of new headquarters to be constructed at Peterson AFB. For the FY 1984 Military Construction Program, the former plan to build an addition to the Wing Headquarters, along with altering several other base facilities, was no longer viable. In the summer of 1982, Space Command manning projections were, at a minimum, 480 positions above the existent NORAD HQ staff level of 800. Consequently, General Hartinger led an effort to change the FY 1984 Military Construction Program to include a new separate headquarters facility costing about $19.5 million.[44]

The Denver architectural-engineering firm of Henningson, Durham and Richardson (HDR) performed the early design work for the headquarters, consolidating the user's requirements into a project book by 15 October 1982. Criteria established by Space Command guided the firm's work. Space Command wanted a building whose exterior design projected the futuristic space orientation of the new command. Interiorly, it must house 1,327 people in 225,000 square feet and be easily altered to accommodate the movement of organizations. HDR incorporated five concepts in its design for the headquarters. The firm planned open office space to the greatest extent possible, systems furniture, minimum use of demountable or permanent walls, a controlled area for the headquarters, and maximum security for the Space Command Commander, Deputy CINCNORAD, and Vice CINCNORAD.[45]

The project soon encountered problems. In Program Budget Decision (PBD) 306 issued in late October, the OSD

Comptroller deferred the Space Command Headquarters Project Plan FY 1984 to FY 1985. The Air Force Budget Review Board then elevated the project to a major budget issue and requested consideration under the Defense Relocation Program. This brought the matter before the Defense Resource Board. But on 29 December 1982, the Board denied the request, recommending, as PBD 306 did, deferral of consideration of a new Space Command Headquarters to the FY 1985 Military Construction Program.[46]

In the meantime, the authorized manpower for the new headquarters continued to increase. By October the Space Command staff had identified additional manpower needed for the headquarters and the figure increased to 1,450. This would limit each occupant in the 225,000 square foot building to 88 square feet.[47]

Designing a headquarters which was suitable but austere helped Space Command's argument that the building of a new headquarters was cost effective. Remaining in the Chidlaw Building would cost the Air Force three million dollars annually, two million in the Standard Level User Charge and about one million in escalated construction cost of the headquarters due to inflation. At this rate, the new building at Peterson AFB could be amortized in about seven years.[48]

There were also several security considerations which favored the construction of a new headquarters. It would be more economical to construct the added vault space that would be needed for Space Command in a new headquarters building than to continue to construct vaults in the privately owned Chidlaw Building, thus incurring non-recoverable expenses. Also, the new headquarters, with its ample vault space, would give Space Command the ability to work with highly classified national programs.[49] In a memo to General Hartinger on 14 October 1982, Lt General Henry, Space Command's Vice Commander, underlined the necessity for the new building to meet strictest security standards. He noted it was "vastly cheaper" to build the highest security into the headquarters "from scratch" rather than modify later.[50] Moreover, a headquarters at Peterson AFB would provide adequate security protection for Space Command's commander and his senior staff, which the Chidlaw Building, even with improved physical security measures, could not provide.[51]

On 17 December 1982, the architectural firm of Peckham, Guyton, Albers & Viets (PGAV) was chosen to design

the building. PGAV immediately began developing design concepts. At the same time, Space Command reviewed the scope of the project with an eye toward revision if necessary. Its staff would make sure the new facility met all requirements, and would maintain contact with the Air Staff and the Office of the Secretary of the Air Force to insure continued support for the headquarters in the FY 1985 Program Objective Memorandum.[52]

NCMC Diesel Engines and Power Upgrade Project

The NORAD Cheyenne Mountain Complex (NCMC) used both its own diesel engines and commercial energy to power its computers, environmental systems, blast protection devices, and other facilities. The NCMC had six diesel engines and generators, and when it operated on commercial power, at least two of the engines ran in parallel, to guarantee an uninterrupted energy supply. The diesels had received heavy use in the 1970s, and contingency overhauls were made on them in 1980 and 1981.[53] During 1982, NCMC maintenance crews gave the engines a series of more thorough overhauls. This work on engines five and six was completed during the autumn,[54] and the diesels showed marked improvement.[55]

In spite of these successful overhauls, the diesel plant required continuing attention, and its problems raised the larger issue of ensuring the most reliable power system possible for the NCMC. Specifically, the command identified the need for an uninterrupted supply of electricity to the Mountain's computers, which once shut down could take hours to bring back on line. Moreover, the potential loss of information in a computer's memory was a serious problem. If memory data was lost in an outage, the operators would recover the information, whenever possible, from the computer's master file. If recreating the data required reprogramming with new software, the costs in money and lost time would be high.[56] The command's long term solution to the power problem was a major upgrade project that would make the reliability of the NCMC's utility systems compatible with the reliability of its computers. The Mountain's critical computers and communications equipment would operate on commercial power, and its diesel engines, with quick start capability, would be available on standby. Quick start capability depended on procedures such as preheating and pre-lubricating the engines to operating temperatures, and it also required engine modifications, which would be included in the upgrade project.[57]

The command intended to fund the power upgrade project from the Military Construction Program (MCP), in two phases. The first was authorized at $11 million in the fiscal year 1982 MCP and was eligible for appropriation from fiscal year 1983 MCP funds.[58] Phase one would provide for an uninterruptable power supply (UPS) to all of the NCMC's critical computers and communications during power disruptions or transfers, and for a new supervisory control system, a computer program that would monitor and identify problems throughout the NCMC's utilities network. Phase one also included the quick start modifications to the diesel engines. Contractors would install oil pump timers, modify the piping and heating systems, and provide circulating pumps to distribute warm water throughout each engine, for consistent temperature control.[59] Phase two, using $10 million in the fiscal year 1985 MCP, included upgrading the electrical power substation and medium voltage switchgear, and installing an electromagnetic pulse filter and sensor points for the supevisory control system.[60]

In mid-December 1981, Black and Veatch Consulting Engineers, a Kansas City, Missouri firm, began designs for the power upgrade project, supervised by the Army Corps of Engineers.[61] In March 1982, Black and Veatch gave the Corps of Engineers a preliminary cost estimate of about $27 million for the project, an amount which exceeded the funding programmed in the fiscal year 1982 MCP.[62] At the end of March, the Corps of Engineers and NORAD completed their reviews of the company's preliminary designs,[63] which made it apparent that upgrading the electrical distribution system, replacing the supervisory control system, and modifying the engines for quick starts would be more expensive than expected.[64] The office of the Air Force Regional Civil Engineer, Dallas, Texas, suggested reducing costs by deleting the new supervisory control system and the UPS. NORAD rejected this approach, since these two elements were essential to the project.[65]

In early April the command sought support beyond the MCP by asking for 3080 funds, Base Procured Investment Equipment funds that were allocated by HQ USAF for use over two years.[66] HQ USAF agreed to budget $2.6 million in fiscal year 1983 equipment funds, directing that the UPS be

purchased under a Navy supply contract. Black and Veatch continued their design work during the remainder of the year, passing a 60 percent design review on 15 September.[67] At the end of 1982, the power upgrade project had reached the 65 percent design stage, with design completion anticipated in early April 1983. In December 1982 the Omaha District Corps of Engineers prepared a Request for Technical Proposal for the UPS, and expected to advertise for contractor bids early in 1983.[68]

and critical system elements must have improved survivability. Since early 1980, when the OSD had begun a study of future TW/AA requirements, considerable attention had been given to identifying deficiencies in the TW/AA system, to defining ways to correct them in an orderly and effective manner, and to obtaining the funds to make the improvements. In October 1981, the President gave a substantial boost to these efforts when he gave strategic command, control, and communications high priority in his strategic modernization program. NORAD gave emphasis in its planning to programs which would insure timely and unambiguous warning. At the top of the list were correction of long standing deficiencies in ballistic missile warning sensors and improvements in the NORAD Cheyenne Mountain Complex. Some survivability improvements were also included in sensor, command center, and communications upgrades.

Sensors

The Defense Support Program

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* The SPS was a self-contained, modular facility, characterized by austere manning, essentially automatic mission operations, and high availability for processing data from one satellite. The site consisted of one 38 foot antenna, three transportable shelters, and three power units.

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Chapter III

SPACE DEFENSE

During 1982 funding for most of the command's high priority programs was sufficient for it to continue improving the network of missile warning and space defense sensors and the command, control, and communications system in the NORAD Cheyenne Mountain Complex. The first three Ground-Based Electro-Optical Deep Space Surveillance System sites were turned over during 1982. Diego Garcia was chosen for Site 4 / The modification of the ALTAIR radar at the first Pacific Barrier Network site was finished, and the re-installation of the AN/GPS-10 radar at the second site neared completion. Surveys of Guam and Saipan established the latter as the preferred location for the third Pacific Barrier site. To complement these ground-based sensors, Space Command sought a Space-Based Space Surveillance System, which it expected to become operational early in the 1990s. Another high priority was the development of an air launched anti-satellite, in response to the ground-launched anti-satellite which the Soviet Union already had deployed. Improvements in command and control centered on the Space Defense Operations Center (SPADOC), where two competing firms prepared their proposed design specifications for SPADOC 4, the fourth and major phase of the operations center's ongoing development. The SPADOC Computation Center received new software versions, and the command studied plans for moving the Alternate SPADOC Computation Center from Eglin AFB, Florida. In August construction crews finished the facility for the Prototype Mission Operations Center, which would be used for anti-satellite testing and command and control. Testing of communications between the computers of the Prototype Mission Operations Center and the Communications System Segment began in November.

At least two command and control efforts attracted wide popular attention during the year. ADCOM and Space Command supported the three Space Transportation System flights of 1982, which were publicized nationally. There was also high public interest in the planning for construction of the Consolidated Space Operations Center east of Colorado Springs.

Space Systems

Sensors

Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) System and Baker-Nunn.

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. TRW Incorporated had contracted for the network in 1978. GEODSS plans called for locating the five sites at roughly equal intervals around the globe, within 35° of the equator, and with most sites north of it. Each site was to have three telescopes connected to a tactical operations room (TOR).[1]

GEODSS was intended to replace the Baker-Nunn space camera, developed during the late 1950s by Joseph Nunn in collaboration with Dr. James G. Baker, who designed its optics.[2] In 1982 Bendix Field Engineering Corporation and Joseph Nunn Associates operated on contract four Baker-Nunn camera sites: Edwards AFB, California; Mt John, New Zealand; Pulmosan, South Korea; and San Vito, Italy. Canadian Forces operated a fifth site at St Margarets, New Brunswick.[3] Both Baker-Nunn and GEODSS operations required darkness at the camera site, sunlight illuminating the subject satellite, and no cloud cover. The chief advantage of GEODSS over Baker-Nunn was speed. The film from a Baker-Nunn camera ordinarily would not be developed until after a night's operations, and the resulting observations were hours old by the time they entered the Space Detection and Tracking System. GEODSS would read out its data almost instantaneously.[4]

Initial operational test and evaluation (IOT&E) began at GEODSS Site 1, Socorro, New Mexico, on 15 February 1982.[5] The contractor, TRW, and the Electronics Systems Division (ESD) of Air Force Systems Command (AFSC) were responsible for the site's development; the Strategic Air Command (SAC) served as test director; and ADCOM/NORAD--which eventually would use GEODSS--advised SAC.[6] By early March the IOT&E encountered troubles. The SAC test directors and NORAD personnel observing the IOT&E were concerned in particular that ESD had not supplied computer discs with the programming documentation specified in the GEODSS Statement of Work and A-Specification, the

broad, system-level statement of the project's requirements. Headquarters personnel observed the Site 1 IOT&E, and noted to SAC the delay in delivering the computer discs and other deficiences in the testing.[7] On 9 and 10 March SAC and Site 1 representatives discussed these problems with ESD and TRW personnel, who agreed to correct the shortcomings as soon as possible.[8] Although the deficiencies in programming documentation were not met during IOT&E,[9] by 4 May SAC was "pleased with the significant progress made toward Site 1 turnover," and on 21 May accepted the site from ESD.[10]

In June 1982 it appeared that plumbing and other facility problems would delay the completion of GEODSS Site 2, Taegu, South Korea. The Army Corps of Engineers, ESD, and SAC had to supervise the re-design and installation of the site's Halon fire fighting system, and civilian contractors had to repair waterpipes and ceiling tiles in the Taegu tactical operations room.[11] The SAC detachment at the site estimated this work would take six weeks or longer. On 24 June NORAD suggested to SAC that, with sound planning, the Halon installation and repairs in the TOR could be done without disrupting acceptance testing, and the Corps of Engineers followed this strategy in directing the Korean contractors who completed the repairs in the tactical operations room and began the Halon work.[12] HQ SAC wanted Site 2 to meet acceptance test standards including: one full night (eight hours) of operations; 100 observations, compiled roughly equally by its three telescopes; and at least one space object identification track from each sensor. HQ NORAD agreed with SAC that these acceptance tests should be passed before ESD turned the site over to SAC.[13] Site 2 passed the last of SAC's acceptance tests during the summer of 1982, and SAC received the site from ESD on 10 September 1982.[14]

At GEODSS Site 3, Maui, Hawaii, contractors again had to resolve minor facility problems, and the site had to pass the same acceptance tests as Taegu.[15] During the summer of 1982, the Corps of Engineers supervised contractors who weather-proofed the sensor towers and extended Tower 1's retaining wall to limit soil erosion. The Corps also initiated plans to move the site's air conditioning condensors, which produced heat plumes that interfered with sensitive long wave infra-red observations, away from the telescopes.[16] Site 3 passed acceptance testing during the summer, in spite of weather delays, and SAC received the Maui site on 15 November.[17]

THE SPACE DETECTION AND TRACKING SYSTEM
1982

Site	Unit	Equipment
Cheyenne Mountain, CO	NORAD Command Post	Space Defense Operations Center (SPADOC) and SPADOC Computation Center (SCC)
Dahlgren, VA and nine southern U.S. sites from CA to GA	U.S. Naval System Surveillance System (NAVSPASUR)	Computational Center three transmitters six receivers
St Margarets, New Brunswick	Canadian Forces	Baker-Nunn Camera and SOI Photometer
	USAF SPACETRACK DEDICATED SENSORS*	
Edwards AFB, CA	Bendix Field Engineering Corp and Joseph Nunn Associates (contractors)	Baker-Nunn Camera
Mt John, New Zealand		
San Vito, Italy		
Maui, HI	OLLA, 46 AERODW	Maui Optical Tracking and Identification Facility (MOTIF) (Electro-Optical)
Socorro, NM	Det 1, 1 STRAD	Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) Site 1
Taegu, South Korea	Det 2, 1 STRAD	GEODSS Site 2
Maui, HI	Det 3, 1 STRAD	GEODSS Site 3
San Miguel, Philippines	17 SURS	AN/GPS-10
	CONTRIBUTING SENSORS	
Kwajalein Atoll, Marshall Islands	Kiernan Reentry Measurement System (KREMS)	ALTAIR, ALCOR Radars
Westford, MA	MIT Lincoln Laboratory	Millstone Hill Haystack Radar
Ascension Island	Eastern Space and Missile Center	FPQ-15
Antigua Island	Eastern Space and Missile Center	FPQ-14
Grand Turk Island	Eastern Space and Missile Center	FPQ-14
Kaena Point, HI	Western Space and Missile Center	FPQ-14

COLLATERAL SENSORS

Thule, GL	Ballistic Missile Early Warning System (BMEWS)	Four FPS-50, one FPS-49
Clear, AK	BMEWS	Three FPS-50, one FPS-92
Fylingdales, UK	BMEWS	Three FPS-49
Eglin AFB, FL	Sea-Launched Ballistic Missile (SLBM) Warning	FPS-85 (Phased Array) and Alternate SCC
Otis ANGB, MA	SLBM Warning	FPS-115 (Phased Array)
Beale AFB, CA	SLBM Warning	FPS-115 (Phased Array)
Concrete, ND	Perimeter Acquisition Radar Attack Characterization System (PARCS)	FPQ-16 (Phased Array)
Shemya, AK	COBRA DANE	FPS-108 (Phased Array)
Pirinclik Installation near Diyarbakir, Turkey	TUSLOG Det 8	One FPS-17, One FPS-79

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*(U) The sensor network was divided into three categories:

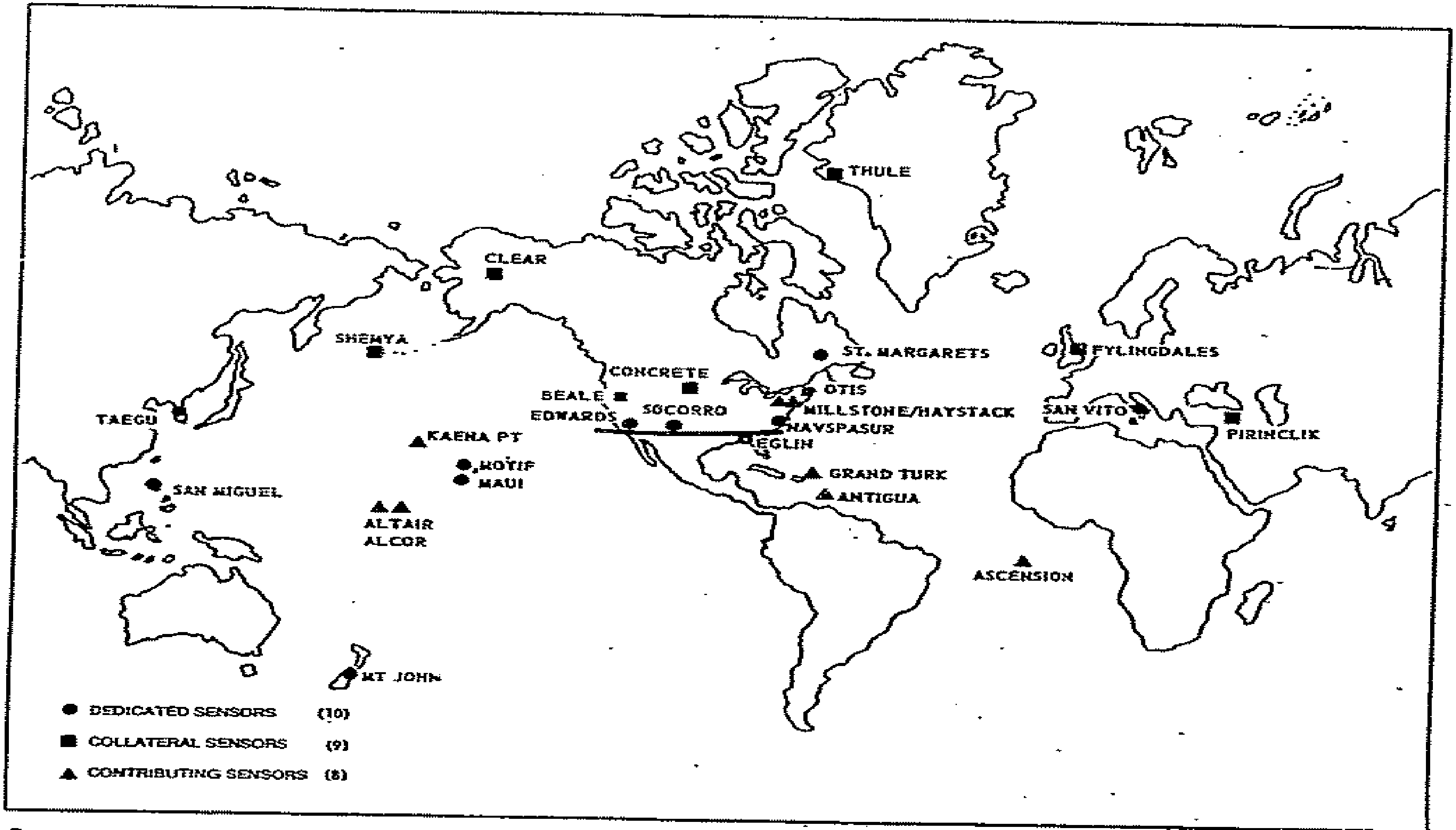
(1) Dedicated—a NORAD/ADCOM operationally assigned sensor with a primary unclassified mission of Space Detection and Tracking System (SPADATS) support.

(2) Collateral—a NORAD/ADCOM operationally assigned sensor with a primary mission other than SPADATS support.

(3) Contributing—a non-NORAD/ADCOM assigned sensor with a primary mission other than SPADATS support but which is under contract or agreement to support SPADATS.

SOURCE: Rpt (S-Revw 1 Jan 89), NORAD/J-3CC, "North American Aerospace Defense Command/ Space Command Forces and Program Change Summary," 1 Jan 83 (material used unclassified).

SPACE DETECTION AND TRACKING SYSTEM



Source: Rpt (S-Revw 1 Jan 89), NORAD/J-3CC, "North American Aerospace Command/ Space Command Forces and Program Change Summary," 1 Jan 83 (material used unclassified).

The State Department, with the cooperation of the Defense Department and the Joint Chiefs of Staff, would negotiate the location of Site 4 with a host country. During 1982 ADCOM/NORAD, having considered Israel, Egypt, and other possible sites, worked under the assumption that Site 4 would be on Diego Garcia, the British protectorate in the Indian Ocean. Headquarters USAF, in consultation with ADCOM and AFSC, endorsed Diego Garcia for Site 4 in November 1982.[18]

A 10 November 1981 Program Management Document directed AFSC to obtain contractor estimates and proposals for both a permanent GEODSS Site 5 and a "relocatable" one made up of temporary buildings which could easily be moved and reassembled. Early in 1982 the Office of the Secretary of Defense considered the possibility of a relocatable site, as an alternative to the permanent facilities of the earlier sites.[19] The relocatable plan required metal buildings, which were subject to corrosion, and the idea was abandoned.[20]

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As the five GEODSS sites became operational, they would replace the Baker-Nunn locations. The Baker-Nunn cameras at San Vito and St Margarets were to remain in service until GEODSS Sites 4 and 5 reached initial operational capability. The other three Baker-Nunn sites, Edwards AFB, Mt John, and Pulmosan would stay open at least through the end of fiscal year 1982, and then retire as permitted by the performance of GEODSS Sites 1 through 3.[25]

The delays in the GEODSS program necessitated retaining the Baker-Nunn sites longer than originally planned. Only the Pulmosan location, which was deactivated on 30 September, closed during 1982. In December 1982, HQ Space Command expected the Mt John site to remain in service an additional year, until the end of fiscal year 1983, and the Edwards AFB site to continue "in operation through a significant part of FY 84."[26]

b1 Pacific Barrier (PACBAR) Network.

The three sites were the Kwajalein Atoll in the Marshall Islands, San Miguel in the Republic of the Philippines, and Saipan in the Northern Mariana Islands. Each PACBAR site would employ a different radar system.[27]

Kwajalein Atoll, the most eastern location in the PACBAR, would use the U.S. Army's Advanced Research Projects Agency Long Range Tracking and Instrumentation Radar (ALTAIR). During 1982, GTE Sylvania, directed and supervised by MIT Lincoln Lab, modified the ALTAIR to give it the ability to track objects in deep space.[28] The modified radar began its system verification test in mid-September and reached initial operational capability on 1 October 1982, making Kwajalein the first operational PACBAR site.[29]

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It had been removed from Ko Kha, Thailand, in 1976 and stored at Clark AB, the Philippines.[30] During the autumn of 1982, contractor crews of General Electric, directed by HQ SAC, removed the radar

from storage and re-installed it at San Miguel. The re-installation was delayed by Typhoon Faye, and by water damage and corrosion which the radar components had suffered in the six years of storage.[31] On 31 December Space Command expected the AN/GPS-10 to begin acceptance testing on 10 January 1983 and reach initial operational capability in April.[32]

In the fall of 1982, Space Command conducted surveys of Guam and Saipan as possible locations for PACBAR III, the central site of the network.

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This secondary mission was the chief factor in the selection of Saipan rather than Guam. Another factor was the discouraging experience of the National Aeronautics and Space Administration when it had attempted to negotiate a lease for a Guam site.[33]

PACBAR III would use a C-band radar that had been removed from the decommissioned U.S.N.S. Arnold in February 1982. The Western Space and Missile Center would be responsible for re-installing the C-band radar on Saipan. Late in 1982 HQ USAF tried unsuccessfuly to secure fiscal year 1984 Military Construction Program funds for PACBAR III. At the close of 1982, Space Command hoped the Saipan work could begin during fiscal year 1985 and the site could become operational in early fiscal year 1987.[34]

Space-Based Space Surveillance (SBSS) System. The Soviet Union's deployment of an anti-satellite system made Air Force leaders more certain the United States should develop a space-based surveillance system, a series of satellites which would be able to detect and track other satellites and anticipate attacks on American and other friendly spacecraft. An SBSS system offered important advantages: it could maintain a continuous surveillance fence, it would avoid the diplomatic negotiations required to lease overseas sites for ground-based sensors, and its satellites would be difficult to jam or spoof.[35]

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In mid-1982, AFSC's Space Division laid out the new program that would produce a prototype SBSS system, and intended to request system proposals from contractors during fiscal year 1983 and award contracts as early as fiscal year 1984.[38] The Air Force Program Objective Memorandum (POM) for fiscal year 1984 funded the SBSS system's design, with a shortfall of $10 million. ADCOM and AFSC hoped this shortage would be made up in the fiscal year 1985 POM.[39]

During the last quarter of 1982, Space Command sponsored the preparation of a System Operations Concept (SOC) for the SBSS. Science Applications Incorporated, a Colorado Springs firm, completed a preliminary SOC on 28 October for the Space Command, which distributed a copy to Space Division. Space Command functional offices finished their reviews of the preliminary SOC in December, and began revising the draft for directorate-level coordination. On 31 December, Space Command anticipated the SBSS system would reach initial operational capability in fiscal year 1993.[40]

Air Launched Anti-Satellite System (ASAT)

Air Force leaders had long been interested in deploying an anti-satellite (ASAT) in response to the Soviet Union's ASAT program, which had begun with tests in 1968. The Soviet ASAT could destroy a target satellite by approaching it and exploding shrapnel that shattered the target. The United States ASAT envisioned in 1982 would use a two-stage missile, with a short range attack missile (SRAM) as the first stage and an Altair 3

motor as the second, launched into space by an F-15 and equipped with a homing miniature vehicle. The miniature vehicle would seek out its target with an infrared sensor, and destroy the target in a high speed collision.[41]

During the late winter and spring of 1982, the Office of the Secretary of Defense (OSD), HQ USAF, and AFSC completed reviews of the ASAT program. The OSD added $180 million in proposed funding for ASAT development, spread over three years. It increased ASAT monies for fiscal year 1983 by $30 million, for fiscal 1984 by $50 million, and for 1985 by $100 million.[42] Reviewing the program in March, HQ USAF recommended that ASAT flight testing* begin in fiscal year 1983 and that the system achieve initial operational capability by fiscal 1987.[43] At the time of this review, HQ USAF Program Decision Package B086 supported a total of 10 ASAT test launches, which included both development, test and evaluation (DT&E) and initial operational test and evaluation (IOT&E) launches.[44] At HQ USAF's request, AFSC offered proposals on how the $180 million in new funds might best be spent. AFSC recommended it be used to lower the risks of failure in the test flight program, by increasing the program from 10 to 12 launches. HQ USAF endorsed a combined DT&E and IOT&E of 12 launches, to be conducted during fiscal years 1983-1985.[45]

In April, Deputy Secretary of Defense Frank C. Carlucci outlined the Defense Department's policy on ASAT requirements and planning. "The primary need for a US antisatellite capability," the Deputy contended, "is to deny the Soviets unilateral control of space or the uninhibited use of space-based systems, especially those which could directly support their military forces in a crisis or conflict." Emphasizing that the "need for an antisatellite capability exists today," Mr. Carlucci urged development of an ASAT able to operate against low altitude (90 to 550 nm) satellites as soon as possible, "but no later than FY-87."

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* On ASAT flight testing, see also "Prototype Mission Operations Center (PMOC)," this chapter.

For the longer term, he asked the Air Force, supported by the othe services, the JCS, and the Defense Intelligence Agency, to begin plans for an ASAT able to operate against elliptical and high altitude satellites.[46]

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While Space Command was pleased with OSD's commitment to ASAT development, it also had concerns about the program. During the Secretary of the

Air Force September 1982 program review, the command questioned the adequacy of the test program and the longevity of the system's SRAM booster. The ASAT would be assembled with 15-year-old SRAMs, which might not remain serviceable through the ASAT's 10 year lifetime. The propellant for the missile's upper stage might become unreliable after extended "captive carry" at aircraft cruise altitudes. There was also the possibility that the proposed system might be countered by Soviet decoys.[51]

) The most serious limitation of the air launched ASAT, for the long term, was that it would be effective only against low altitude targets. During 1982 the planned maximum intercept altitude was decreased, until by November plans called for it to be b1

Air Force Systems Command had sought a high-altitude program in 1981 and 1982, but HQ USAF had not supported funding for it in the Program Objective Memorandum.[52]

Command and Control

Space Defense Operations Center (SPADOC)

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The SPADOC had its origins in a March 1979 memorandum of Dr. Gerald P. Dinneen, Assistant Secretary of Defense for Communications, Command, Control, and Intelligence. Assistant Secretary Dinneen envisioned the SPADOC "as a centralized management and operations center," initially with limited capabilities, but able to expand as weapon systems became operational and space defense capabilities increased. The SPADOC would grow in an "evolutionary process," through a series of phases that would upgrade its computers, computer programs, communications systems, and other assets.[60]

The SPADOC expanded much as Dr. Dinneen's memorandum had anticipated. During the summer of 1979 initial SPADOC support to the ASAT program began, but there was then no central operations control and no dedicated facility. This initial support effort was later referred to as SPADOC "Phase Zero." ADCOM activated SPADOC Phase 1 on 1 October 1979, at first a modest operation of two crewmen in the ADCOM Intelligence Center and two dedicated communications circuits with space system owners and operators.[61] A full complement of trained SPADOC watch crews was available by the end of 1979.[62] SPADOC 2 began operation in July 1981, with a dedicated facility in Room 2308 of the NORAD Cheyenne Mountain Complex, increased personnel, and added communications circuits with the Satellite Control Facility and the Johnson Space Center.[63]

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December 1981, ESD had awarded the Martin Marietta Corporation and Ford Aerospace and Communications Corporation definition phase contracts for SPADOC 4.[66] During 1982 the ADCOM staff reviewed the system concepts proposed in competition by Martin Marietta and Ford Aerospace. ADCOM, through the System Program Office, commented on the feasibility of the contractors' concepts, but offered no specific preferences for computers, programs, or displays, to avoid misleading either of the competing firms. ESD would award the development phase contract to Martin Marietta or Ford Aerospace in 1983.[67]

Until August 1982 the contractors planned their proposals in accordance with the SPADOC 4 System Operational Concept (SOC) for a Space Defense Command and Control System, approved by CINCAD on 13 May 1980. ADCOM DCS/Plans prepared a new SOC, that differed from the 1980 document in emphasizing the development of a SPADOC 4 which would perform as a "fully capable operational center." Specifically, the 1982 SOC included: moving the SPADOC to Room 2308 of the NCMC; adding functions to SPADOC that the Integrated SPADOC, IDHS,* and SCC (ISIS) Steering Group** had identified it could perform; and providing more detailed information about SPADOC organization and manning.[68]

During the late summer of 1982, ADCOM/NORAD prepared the SPADOC 4 Statement of Work, A-Specification, and Request for Proposal (RFP), which stated the specifications that contractors would have to meet in the development phase contract. ESD asked ADCOM/NORAD to include in the RFP its

* The IDHS was the Intelligence Data Handling System, a network of computers which supported the SPADOC.

** The ISIS Steering Group, which had first met in January 1981, reviewed and coordinated ADP acquisition for the SPADOC and SCC.

position on "cutover," the transition from SPADOC 3 to SPADOC 4.[69] To avoid unnecessary major modifications, SPADOC 4 would be developed in three phases, A through C.[70] ADCOM/NORAD considered several plans for the cutover from SPADOC 3 to SPADOC 4A.[71] Two plans appeared promising: combining SPADOC and SCC operations in a single room, and relocating for about 90 days the minimum essential equipment and personnel from Room 2308, while it was modified, to the ADCOM Intelligence Center, Room 9302.[72] The temporary relocation plan would give the contractor free access to Room 2308 and could be supported efficiently and securely by operations and intelligence personnel.[73]

On 10 September, Space Command explained to ESD that it was considering these two plans for SPADOC 4A cutover. The command recommended that ESD conclude its work on the RFP, with provisions for separate SCC and SPADOC facilities, while determining the cost and schedule for integrating the SCC and SPADOC in a single room. The two approaches could then be evaluated to determine which should be carried out in the development phase contract. On 17 September, ESD released the RFP and proposals were received 8 November.[74]

<u>SPADOC Computation Center (SCC): Software Additions</u>. New software, or computer programs, were introduced continually at the SPADOC Computation Center (SCC) to improve its capabilities. Software versions were developed as part of the Program Modification Request process, which made changes in the computer programs of the NCMC after thorough reviews of requirements and costs by several offices within the Space Command deputates of Operations and of Communications, Electronics, and Computer Resources. The software versions usually were designed by contractors, and in some cases, by the Directorate of NCMC Systems Software, DCS/Communications, Electronics, and Computer Resources.[75]

SCC Software Version G, released in January 1982, included several important programs. Its SCC Executive restart/recovery logic was a logic program that ran the General Comprehensive Operating Supervision system, the SCC's "off the shelf" operating system. The version also included Man-Machine Interface failover logic, which improved the "interface" or communication between operators and the system's graphic display consoles. Version G contained four major applications programs: Assignment File Sort (AFSORT), Data Base Check (DBCHK), Deep Space Tasking (DSTASK), and Predictive Avoidance (PRDAVX). AFSORT pro-

vided displays or print-outs of Assignment File data, reordered by addressee groups, allowing operators to sort out sensor sites by geography or organization. The DBCHK program "checked out" or tested the SCC's data base files for errors. DSTASK assigned tasking on deep-space satellites to deep-space sensors, and the PRDAVX was one of a series of applications programs that eventually would fully automate the SCC's laser radiation programming.[76]

SCC Version H began operational test and evaluation (OT&E) on 29 March. It included a PRDAVX applications program which would help prevent space-based lasers from irradiating other space objects, and two other major modifications, TRACKS and Manual Observation Input (MOBIN). TRACKS was an applications program developed to help the SCC process unknown space objects, and MOBIN converted manual inputs to standard SCC internal format.[77]

The third version introduced during the year was Version I, which began OT&E on 15 November. Its PRDAVX phase gave the SCC the ability to determine maximum effective laser radiation ranges. Another component of Version I was Sensor Manager, a program that allowed operators to make changes, almost instantaneously, in the sensor limits and position file--the NCMC's record of every sensor's operational limits and its position on the globe, information which determined whether a sensor could perform a particular tasking at a given time. The version also introduced Satellite Plot, an applications program that provided a graphic display of satellites by apogee, perigee, and period.[78]

SPADOC Computation Center (SCC): Alternate SPADOC Computation Center (ASCC).

During 1982, ADCOM/NORAD re-examined the possibility of moving the ASCC to the PAVE PAWS SE site, taking into account the ASCC's operations, communications, and other requirements. To fulfill its responsibilities under CINCAD/CINCNORAD operations plans and regulations, the ASCC had to meet the computation requirements of the SCC and SPADOC 4, and the mission requirements of the IDHS and of space object identification (SOI) support. It had to maintain, if primary communications failed, a list of Satellite Reconnaissance Advance Notice (SATRAN)* satellites and the Joint Chiefs of Staff Target List, and remain current--within 24 hours--on the information in SCC and SOI data bases. Under some contingencies, the ASCC also might have to assume command and control functions delegated to it by the NCMC Back-Up Facility. The ASCC's ability to perform these operations depended on maintaining secure communications with SPADOC, the SCC, the ADCOM Intelligence Center, the Back-Up Computational Facility** at the Naval Space Surveillance System Headquarters at Dahlgren, Virginia, and other agencies. The ASCC's other requirements included: ADP equipment and SCC, IDHS, and SOI computer programming; enough manning for contingency operations without using augmentees; and a secure facility on a military installation.[83]

Having considered these factors, NORAD DCS/Operations concluded on 1 April that PAVE PAWS SE was a "serious candidate" for the ASCC, but that the Center's requirements, relocation costs, and other factors should be weighed for alternative sites, before making a final commitment to the relocation to Robins AFB. Other sites considered during the year included the Naval Space Surveillance System Headquarters, at Dahlgren, Virginia, and

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** The Back-Up Computational Facility (BCF) would assist the ASCC with calculations, when the ASCC was not able to provide all the computations the National Military Command System required. The BCF had no command and control functions.

three possibilities near Colorado Springs, Colorado: the planned Consolidated Space Operations Center, the Technical Development and Training Center at Peterson AFB, and the Back-Up Facility for the NORAD Cheyenne Mountain Complex.[84]

By June 1982, several considerations clouded the planned move to PAVE PAWS SE. The funding for PAVE PAWS SE was too low to include the ASCC, and ADCOM asked the ESD to obtain cost estimates for incorporating the Center with the phased array radar site. ESD estimated the program cost at $200 to $300 million. Contractor competition was another consideration. The Raytheon Corporation was the sole contractor for the PAVE PAWS SE, and ADCOM questioned the propriety of the ASCC also being awarded to Raytheon as sole contractor, since other corporations might seek competitive bidding on the project. ESD believed that, in particular, the two competing SPADOC contractors--Ford Aerospace and Martin Marietta--might lodge "well founded" protests at the ASCC contract going to Raytheon, which had not bid on SPADOC acquisition. Time was also a factor: the PAVE PAWS SE RFP was to be released in September, giving ADCOM/NORAD and ESD only about two months to develop the schedules and costs for the ASCC to be included in the PAVE PAWS proposal.[85] The governing Program Management Document required the ESD to have PAVE PAWS SE on contract by 1 March 1983,[86] and ESD feared that an effort to add the ASCC to the Robins site would "cause costly delays" in the PAVE PAWS program.[87]

In the face of these difficulties, it remained essential that the ASCC stand ready to support the SCC and provide continuity of operations between the time Eglin closed and SPADOC 4 began operations. In late August and early September, a NORAD/ESD team visited Eglin to determine the requirements of moving the ASCC facility and its equipment to Robins.[88] This team survey established that the ASCC used about 8,000 square feet of floor space at Eglin: 3,200 for computer equipment; 2,400 for office space; and 2,400 for a tactical operations room, analyst data center, intelligence facility, and communications center.[89] ESD determined that 3,000 square feet could be made available for the ASCC at PAVE PAWS SE, within existing funding.[90]

Space Command regarded this 3,000 square feet insufficient, and had reservations about moving from Eglin ADP equipment that represented 1960s technology. Early in November the Directorate of Space Systems, DCS/Operations characterized this ADP hardware as "too old, too slow, too inefficient, and too bulky to put in the new facility."[91]

The directorate concluded on 1 December that the move to PAVE PAWS had "reached an impasse."[92]

At the close of 1982, Space Command remained formally committed to the move to Robins, if it could be made within funding, but the command also had left the door open for other possibilities. Space Command doubted that existing funding would provide enough space at Robins for the ASCC's ADP and communications equipment. It also believed that it would be wiser to plan for ASCC computers and computer programs that would be current with the technology available when the Alternate SCC began its post-Eglin operations, rather than to move old ADP equipment from the Florida base.[93] On 10 December Brigadier General Thomas W. Sawyer, DCS/Operations, asked the Directorate of Space Systems to take a longer view of the issue and prepare a Statement of Operational Need for a post-1986 ASCC, incorporating state-of-the-art ADP technology in place of the present equipment at Eglin. General Sawyer also suggested that DCS/Plans study the costs of moving to locations other than Robins, calling particular attention to the Naval Space Surveillance System Headquarters.[94]

Prototype Mission Operations Center (PMOC). The Prototype Mission Operations Center (PMOC) would provide the aircraft and missile guidance needed for command and control of the air launched anti-satellite (ASAT)* system, and was essential to the ASAT's development, test, and evaluation. ASAT testing would begin with the launch of two instrumented test vehicles (ITVs) by a Scout booster from Wallops Island, Virginia. One ITV would become a target for the ASAT, and the other would be "stored," remaining in orbit for future use. A series of satellite control facility stations would track the target ITV, and provide its orbital data to the SCC. The SCC would refine this information to determine the "element sets," the precise data needed to calculate the satellite's position at any given time, and would communicate this data to the PMOC. The PMOC then would compute the ASAT's opportunities to intercept the target ITV and develop an engagement plan, including launch location, altitude, azimuth, and missile guidance sequence.[95]

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* On the ASAT, see "Air Launched Anti-Satellite System (ASAT)," this chapter.

The PMOC would transmit the engagement plan to the Air Launch Control Center at Edwards AFB. Recorded on a cassette, the engagement plan would be loaded into the F-15 Inertial Navigation System and the ASAT computer. The engagement plan cassette could guide the F-15 to its "launch box," the area--somewhere between 30,000 and 42,000 feet altitude--where the fighter would release the ASAT Sunnyvale AFS, California would report the test's hit or miss data to the PMOC for use in the next launch.[96]

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The PMOC facility was built during the spring and summer of 1982. Sides Construction Company was awarded the contract for $144,750, and on 30 March given notice to proceed with work. Construction began six days later in Room 5101 of the NORAD Cheyenne Mountain Complex, and the facility was turned over to the Boeing Aerospace Company, contractor for the PMOC's communications system, on 20 August.[98]

In early April, while this construction was starting, PMOC communications began interface testing. Space Division contracted with the Boeing Company for the operations center's communications, and Boeing developed a PMOC system at its Kent, Washington, plant. On 8 April, this system communicated with the Communications System Segment (CSS) of the NORAD/ADCOM Off Site Test Facility in the Federal Building, Colorado Springs. The Space Division detachment monitoring the testing reported that, with the exception of some anomalies in computer disks, "(all) test procedures ran satisfactorily."[99]

On 15 November, the PMOC began DT&E verification and validation testing with the CSS. This series of tests had three purposes: to establish the compatibility of the PMOC with the CSS; to determine if PMOC/CSS communications were in compliance with present Interface Control Drawings; and to learn if messages could be transferred without interfering with other CSS operations. The initial communications and the message transfer were successful. The PMOC and CSS interface verification was not successful,

chiefly because a design discrepancy had led to faulty wiring of the computers in Room 5101. On 30 November, during a meeting at the PMOC, Space Division liaison officers suggested to the 47th Communications Group one possible "fix" of the difficulty. At the close of the year, the 47th Communications Group was working to resolve the circuit problem in Room 5101.[100]

Space Transportation System (STS) Support. The most widely publicized of the activities supported by NORAD were the flights of the National Aeronautics and Space Administration's (NASA's) Space Transportation System (STS), known to the press and public as the Space Shuttle. NORAD made important contributions to what NASA's Associate Administrator for the Space Transportation System, Major General James A. Abrahamson, referred to as the STS partnership between NASA and the Air Force. In 1982 General Abrahamson observed: "The partnership forged by the Air Force and NASA since the beginning of the Space Age is continuing with the development of the national Space Transportation System--and, in fact, is being strengthened."[101] NORAD supported this co-operative effort by providing Tracking and Impact Prediction (TIP) for the STS's large external fuel tank, and Computation of Miss Between Orbits (COMBO) for the Orbiter Vehicle. The command also stood ready to help NASA if a communications failure, unplanned reentry, or other emergency disrupted a mission.[102]

During 1982 there were three flights: STS-3, 22-30 March; STS-4, 27 June-4 July; and STS-5, 11-16 November. Colonels Jack R. Lousma and C. Gordon Fullerton completed the nine day STS-3 mission at White Sands, New Mexico. The fourth Shuttle, flown by astronauts Thomas K. Mattingly and Henry W. Hartsfield, carried a classified Department of Defense payload and the first commercial STS experiments. A crew of four astronauts manned STS-5, which launched satellites for Satellite Business Systems and Telesat Canada.[103]

NORAD's TIP program applied to the Space Shuttle and many other space objects: any satellites, payloads, rocket bodies, platforms, or pieces of debris larger than one square meter which survived reentry into the atmosphere. The SCC tracked decaying objects and supplied data on when and where they would reenter the earth's atmosphere. NASA had asked the command to provide TIP for the reentry of

the Shuttle's external tank, through at least STS-13.[104]

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During STS-3, NASA's only external tank TIP information came from ADCOM/NORAD, since range tracking ships failed to verify the SEWS' data. Although information supplied was accurate as to the fuel tank's release, NASA "missed" the tank's reentry into the Indian Ocean by 300 nautical miles.[108] During the fourth and fifth Shuttle missions, the command again provided routine TIP support.[109]

COMBO was an SCC applications program that predicted the Orbiter Vehicle's approach to any other satellite, a day in advance. Specifically, ADCOM provided NASA with the relative ephemeris points, relative minimum points, the absolute minimum point, and periods of close proximity of the Orbiter Vehicle to another satellite. This information told NASA of the Orbiter's approach to another orbiting object, the closest distance the Orbiter would come to the other satellite, and how long the two objects would be near each other.[110] The SCC made the COMBO computations, and the ASCC and the BCF provided back-up by performing them in parallel.[111] COMBO support placed a premium on ADCOM's keeping its space catalog as up-to-date as possible.[112] During the STS-4 mission, the orbiting Shuttle approached within eight miles of a Soviet rocket body, and ADCOM/NORAD provided NASA with this COMBO data.[113]

Although after each 1982 Shuttle flight it was possible to find areas where additional training, new software programs, or more clearly defined procedures would improve the command's support of the STS, NORAD's contribution to the missions was overwhelmingly successful. After STS-3 landed at Edwards AFB on 30 March, Major General Abrahamson praised the "outstanding support" which ADCOM/NORAD and others had given that flight. The after

action report of the Directorate of Space Operations, DCS/Operations concluded: "ADCOM support thoughout the eight day mission of Columbia by the SPADOC crews was flawless."[114]

Consolidated Space Operations Center (CSOC)

On 20 December 1979, Secretary of the Air Force Dr. Hans Mark had announced plans to build a Consolidated Space Operations Center (CSOC) east of Colorado Springs. His successor, Mr Verne Orr, reaffirmed this decision on 17 March 1981. The proposed operations center would combine the functions of three space control facilities: the Satellite Operations Complex (SOC); the Shuttle Operations and Planning Complex (SOPC); and the NAVSTAR Global Positioning System (GPS) Master Control Station. The SOC mission included monitoring and maintaining primary control of operational military satellites. The SOPC would exercise primary planning control over the Space Transportation System's military and intelligence missions. The NAVSTAR GPS Master Control Station was needed to direct the NAVSTAR GPS, a planned network of satellites that would supply extremely precise positioning and navigation data to military and civilian agencies. In summary, the CSOC would control military satellite and Space Shuttle operations, and the NAVSTAR network, from a single consolidated operations center.[115]

In January 1982, the Senate Appropriations Committee stopped all CSOC activity, freezing the project's fiscal year 1983 Military Construction Program (MCP) funding for at least 60 days, until the committee could review a General Accounting Office (GAO) report to Congress on CSOC planning. The Air Force halted CSOC development at the 60 percent design level. On 29 January, the GAO published its report, which expressed "reservations about beginning full-scale construction at this time because the operational requirements and associated costs for the Center are not sufficiently definitive." The GAO concluded that "the lack of an overall military space plan and the fragmented military space operations structure" had led it to believe "that construction of other than critical backup capability is premature."[116] The GAO recommended that the Secretary of Defense designate "a single manager for the mangement of military space development and operation."[117] (It published this report seven months before the activation of the Space

Command.) The report also recommended that Congress consider restricting MCP monies to funding of an interim "Satellite Operations Complex," and providing funds for a full CSOC only after the Defense Department "had completed an adequate plan for military exploitation of space and a cost-benefit analysis."[118] The GAO further was concerned that the computers and computer programs which the Air Force planned for the CSOC would be out of date by the time the facility became operational.[119]

The Acting Under Secretary of Defense for Research and Engineering, James P. Wade, Jr., replied to the GAO study, objecting in particular to its suggestion that Congress fund only an interim satellite control complex. "The facilities concept, now beyond the 35% design completion point," Mr. Wade argued, "is for a consolidated facility. A restructure would obviate the advantages of consolidation and delay the completion of a shuttle operations and planning capability beyond the point required to adequately support national security space missions."[120]

While the freeze remained in effect the Air Force continued its planning for the Consolidated Space Operations Center. On 22 June HQ USAF's Program Management Directive (PMD) on the CSOC designated the Space Command its operating agency. The AFSC would be the CSOC's implementing command; AFTEC would serve as its operational test and evaluation agency, and the Air Force Logistics Command as its supporting command. HQ USAF published the CSOC PMD about two months before the activation of the Space Command, and instructed the participating agencies to "continue activities as directed herein until details of Space Command implementation are promulgated." Reflecting the Air Force fiscal years 1984-1988 Program Objective Memorandum, the PMD anticipated the CSOC would have initial operational capability for satellite control operations by late 1986. It would reach initial operational capability for Shuttle control late the following year.[121]

The Consolidated Space Operations Center received its formal name in August 1982. Air Force regulation* provided that the site be designated an Air Force Station. The

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* AFR 87-5 (U), USAF/PRER, "Classification of Air Force Installations," 15 Feb 73.

Space Command DCS/Engineering and Services provided a list of several names, some recalling individuals who had contributed to the United States space program and some reflecting local geography. In early August General Hartinger announced that he and Lieutenant General Richard C. Henry had agreed on the designation Falcon Air Force Station. Falcon, Colorado, was on Colorado Highway 24, about 14 miles from the proposed CSOC site, and the falcon, a rapid flying and powerful bird of prey, was the mascot of the Air Force Academy.[122]

In September, General Hartinger and General Robert T. Marsh, Commander in Chief, Air Force Systems Command, concluded a Memorandum of Agreement on the roles of their two commands during the design, construction, installation, and checkout of the facilities at Falcon AFS and on the support accompanying the CSOC's activation. Space Command assumed responsibility "for the consolidation of operational requirements" for the CSOC, and would provide major command "advocacy for the formulation of SOC and SOPC mission and operational requirements, tasking based on mission needs, and participation in SOC and SOPC development planning." AFSC's Space Division took responsibility "for the planning, development, installation, and checkout of the SOC and SOPC." The Division would create, and chair, a CSOC Activation Steering Committee, composed of representatives from Space Division and Space Command, that would address the management and technical issues of the CSOC's activation.[123]

In late September, at the urging of Under Secretary of the Air Force Edward C. Aldridge,[124] the Subcommittee on Military Construction of the Senate Appropriations Committee lifted the design hold on the CSOC.[125] On 1 October, as the fiscal year began, the Senate and House approved by voice vote a FY 1983 MCP bill of about $7 billion. This legislation included an authorization of $67.7 million for the CSOC, which would be constructed on a 640 acre site nine miles east of Colorado Springs. The bill authorized the Air Force to purchase this site "from the State of Colorado in fee simple interest," and to begin initial construction.[126] Although granting this authorization, Congress accepted some of the GAO's reservations about the Air Force's long term CSOC plans and choice of computers. It directed the Air Force to begin negotiation for purchasing the land and to start first phase construction, "while additional planning is accomplished concerning mission requirements and computer selection."[127]

In August, before the CSOC design freeze had been lifted, HQ USAF had directed comptroller and program officers from several commands to conduct an Independent Cost Study (ICS), updating all of the CSOC's cost estimates. The ICS team was made up of 30 members, drawn largely from the Space Division, but also representing the Space Command, the Air Force Engineering and Services Center, Air Training Command, and Air Force Communications Command. After 35 "man months" of study, the ICS team concluded in October that present CSOC cost estimates were "of moderate risk"[128] and would have to be raised, primarily because of the "increased technical definition" in the equipment and facilities needed for the Shuttle operations and planning complex.[129] The ICS team estimated facilities costs, measured in fiscal year 1980 dollars, at $112 to $159 million, and total development costs at $404 million, with the Shuttle Operations Planning Center accounting for the largest portion of the development monies.[130]

HQ USAF reviewed the Independent Cost Study on 4 November, and moved to convene an Intercommand Working Group eleven days later. The Group was composed of representatives from every command contributing to the CSOC's development. Its task was to restructure the operations center in light of the ICS findings, in time to influence the consideration of the fiscal year 1985 Program Objective Memorandum.[131] The Working Group met at HQ Space Division, Los Angeles AFS, California, 15 through 20 November. Following these meetings, Space Division indicated that it had "a good understanding of the technical, support and administrative (CSOC) facility needs and costs" and also a "good understanding" of the costs for the satellite and GPS missions. It was less confident about the requirements of the Shuttle mission, which it said "continue to elude us in cost and complexity." STS mission control and security, Space Division concluded, "continue to be high cost and difficult requirements issues." Lieutenant General Henry, Space Division commander, argued against "heavy expenditure in (the Shuttle) area until the STS program maturity begins to show." The Division committed itself to developing a CSOC that met all stated requirements, that included the recommendations of the Intercommand Working Group, and fell within the funding of the fiscal year 1984 Budget Estimate Submission. On 9 December, Brigadier General Donald J. Kutyna, Space Division's Deputy Commander for Launch and Control Systems, briefed the Working Group's findings to Under Secretary of the Air Force Edward C. Aldridge.[132]

NOTES

Chapter I

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3. SSS (S-Decl 14 Apr 88), BG C. N. Beer, DCS/Plans, ADCOM, to A/CC _et al_, "Biennial Review ...," 8 Jun 82.

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10. Ibid, pp 27-28 (material used S-Revw 97).

11. Ibid, p 30 (material used S-Revw 97).

12. Ibid, pp 30-31 (material used S-Revw 98).

13. Ibid, p 31 (material used S-Revw 98).

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GLOSSARY OF ABBREVIATIONS

AAC	Alaskan Air Command
ADC	Aerospace Defense Center
ADCCS	Air Defense Contingency Communications System
ADCOM	Aerospace Defense Command
ADCCP	Advanced Data Communications Control Procedures
ADIZ	Air Defense Identification Zone
ADMP	Air Defense Master Plan
ADP	Automated Data Processing
ADTAC	Air Defense Tactical Air Command
AFB	Air Force Base
AFCC	Air Force Communications Command
AFLC	Air Force Logistics Command
AFSC	Air Force Systems Command
AFTEC	Air Force Test and Evaluation Center
AIM	Air Launched Interceptor Missile
AIR-2A	Air Launched Interceptor Rocket-2A
ALCM	Air-Launched Cruise Missile
ALCOP	Alternate Command Post
ALTAIR	Advanced Research Projects Long Range Tracking and Instrumentation Radar
AMRAAM	Advanced Medium Range Air-to-Air Missile
ANG	Air National Guard
ANGB	Air National Guard Base
ANMCC	Alternate National Military Command Center
AS	Air Station
ASAT	Air-Launched Anti-Satellite
ASCC	Alternate SPADOC Computation Center
ASM	Air-to-Surface Missile
AT	Acceptance Testing
AT&T	American Telephone & Telegraph
AUTOVON	Automatic Voice Switching Network
AWACS	Airborne Warning and Control System
BCF	Back-Up Computational Facility
BLOS	Beyond-Line-of-Sight
BMEWS	Ballistic Missile Early Warning System
BNCC	Back-Up Interceptor Control NORAD Control Center
BOD	Beneficial Occupancy Date
BUF	Backup Facility
BUIC	Back-Up Interceptor Control
BVR	Beyond-Visual-Range
CADIN	Continental Air Defense Integration North
CC	Contingency Communications
CF	Canadian Forces
CFB	Canadian Forces Base
CGS	Continental Ground Station

CINC	Commander in Chief
CINCAD	Commander in Chief, Aerospace Defense Command
CINCLANT	Commander in Chief, Atlantic
CINCNORAD	Commander in Chief, North American Aerospace Defense Command
CINCPAC	Commander in Chief, Pacific Command
CMC	Cheyenne Mountain Complex
COMAAC	Commander, Alaskan Air Command
COMBO	Computation of Miss Between Orbits
CONUS	Continental United States
COTR	Contracting Officer/Technical Representative
CPS	Core Processing Segment
CRWG	Computer Resources Working Group
CSOC	Consolidated Space Operations Center
CSS	Communications System Segment
CSS-R	Communications System Segment Replacement
DARPA	Defense Advanced Research Project Agency
db	Decibel
DBX	Digital Bank Exchange
DC	Deputy Director for Communications and Electronics (TAC)
DCA	Defense Communications Agency
DD 250	Hardware Turnover
DEFCON	Defense Readiness Condition
DOD	Department of Defense
DR	Deficiency Report
DRB	Defense Review Board
DSCS	Defense Satellite Communications System
DSP	Defense System Program
DT&E	Development Test and Evaluation
ECCM	Electronic Counter-Countermeasure
ECM	Electronic Countermeasure
ECP	Engineering Change Proposal
ESD	Electronics Systems Division
EW	Electronic Warfare
FAC	Ford Aerospace Corporation
FCS	Full Communications Service
FEC	Federal Electric Corporation
FIS	Fighter Interceptor Squadron
FOC	Full Operational Capability
FOT&E	Follow-On Test and Evaluation
GAO	General Accounting Office
GEODSS	Ground-Based Electro-Optical Deep Space Surveillance (System)
GTESC	General Telephone & Electronics Service Corporation
HDR	Henningson, Durham, and Richardson (Architectural Firm)
HF	High Frequency

IAP	International Airport
ICBM	Intercontinental Ballistic Missile
ICD	Interface Control Drawing
ICS	Independent Cost Study
IDHS	Intelligence Data Handling System
IOC	Initial Operational Capability
IOS	Initial Operating Segment
IOT&E	Initial Operational Test and Evaluation
IRBM	Intermediate Range Ballistic Missile
ISF	Integrated Support Facility
IR	Infra-Red
ITT	International Telephone and Telegraph
ITV	Instrumented Test Vehicle
JCS	Joint Chiefs of Staff
JRSC	Jam Resistant Secure Communications
JSS	Joint Surveillance System
JTD	Joint Table of Distribution
JTIDS	Joint Tactical Information Distribution System
LPS	Large Processing Station
LRU	Line Replacement Unit
M	Million
MCP	Military Construction Program
MCT	Mobile Communications Terminal
MDS	Modular Display System
MGS	Mobile Ground System
MGT	Mobile Ground Terminal
MIP	Missile Impact Predictor
MOA	Memorandum of Agreement
MPF	Multi-Purpose Facility
MTCS	Modular Terminal Control System
MWBP	Missile Warning Bypass
MWO	Missile Warning Officer
NAS	NORAD Alert System
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCMC	NORAD Cheyenne Mountain
NCS	NORAD Computer System
NCP	NORAD Command Post
NE	Northeast
NGB	National Guard Bureau
NMCC	National Military Command Center
NORAD	North American Aerospace Defense Command
NPIT	National Project Industry Team
NW	Northwest
OGS	Overseas Ground Station
O&M	Operation and Maintenance
OPLAN	Operation Plan
ORS	Operational Radar System
OSD	Office of the Secretary of Defense

OT&E	Operational Test and Evaluation
OTH-B	Over-the-Horizon Backscatter
PAA	Primary Aircraft Authorization
PACBAR	Pacific Barrier (Radar Network)
PARCS	Perimeter Acquisition Radar Characterization System
PBD	Program Budget Decision
PGAV	Peckham, Guyton, Albers, and Viets (Architectural Firm)
PMD	Program Management Directive
PMOC	Prototype Mission Operations Center
PMR	Program Modification Request
POM	Program Objectives Memorandum
PRPJ	Plans and Programs (HQ USAF)
PVAS	Primary Voice Alert System
QOT&E	Qualification Operational Test and Evaluation
RAPIER	Rapid Emergency Reconstitution Team
RCC	Region Control Center
R&D	Research and Development
RDJTF	Rapid Deployment Joint Task Force
RFP	Request for Proposal
RIOC	Reduced Initial Operational Capability
ROC	Required Operational Capability
ROCC	Region Operations Control Center
RSSF	ROCC System Support Facility
SAC	Strategic Air Command
SAF	Soviet Air Force
SAGE	Semi-Automatic Ground Environment
SAMSO	Space and Missile Systems Organization
SATCOMA	Satellite Communications Agency (of U.S. Army)
SATRAN	Satellite Reconnaissance Advance Notice
SBSS	Space-Based Space Surveillance (System)
SCC	Space Computation Center
SCP	Survivable Command Post
SDC	Systems Development Corporation
SE	Southeast
SEWS	Satellite Early Warning System
SHSS	System Hardware Support Sub-Segment
SLBM	Sea Launched Ballistic Missile
SLRS	Southern Looking Radar System
SLUC	Standard Level User Charge
SMOPS	Space Mission Organization Planning Study
SOC	Satellite Operations Complex
SOC	System Operational Concept
SOI	Space Object Identification
SON	Statement of Operational Need
SOPC	Shuttle Operations and Planning Complex
SOW	Statement of Work
SPADOC	Space Defense Operations Center

SPO	System Program Office
SPS	Simplified Ground Station
SROCD	System Requirements and Operational Concepts Document
SSE	System Support Element
SSF	System Support Facility
SSM	Single System Manager
STS	Space Transportation System
TAC	Tactical Air Command
TDDL	Time Division Data Link
TIP	Tracking and Impact Prediction
TNCC	Tyndall NORAD Control Center
TOR	Tactical Operations Room (at sensor sites)
TPFDD	Time Phase Force Development Data
TRE	Teal Ruby Experiment
TRG	Tactical Reconnaisance Group
TTW	Tactical Training Wing
TW/AA	Tactical Warning and Attack Assessment
TWS	Track-While-Scan
UCP	Unified Command Plan
UHF	Ultra High Frequency
UNITREP	Unit Representation
UPS	Uninterruptable Power Supply
VHF	Very High Frequency
WAS	Weapons Alert System
WSA	Weapons Storage Area
WSEM	Weapon System Evaluator Missile
WWABNCP	World-Wide Airborne Command Post
WWMCCS	World-Wide Military Command and Control